

REMARKS

In the Office Action, the Examiner rejected claims 1-4, 7-8 and 10-11 pursuant to 35 U.S.C. § 103(a) as being unpatentable over Napolitano (U.S. Patent No. 6,132,375) in view of Freiburger et al. (U.S. Patent No. 6,733,453). Claims 5-6, 9 and 12-34 were withdrawn from consideration. Applicants respectfully request reconsideration of the rejections of claims 1-4, 7-8 and 10-11, including independent claims 1 and 10.

Independent claim 1 recites forming a beam across a synthetic elevation aperture where the forming is a broadband process. Independent claim 10 recites a beamformer operable form a beam across a synthetic elevation aperture where the forming is a broadband process.

Napolitano does not disclose these limitations. Napolitano uses a matched filter in elevation (Col. 6, lines 30-51). The matched filtering is performed in space (see equation 7) or in a spatial frequency domain (see Col. 6, lines 52-60). This matched filtering is described with reference to Napolitano in the current application at paragraph 41. An alternative approach is to use a wideband process, such as beamforming (see paragraph 42 of the current application). The matched filtering of Napolitano is applicable to narrow-band signals. Napolitano does not suggest forming a beam as a broadband process. The point-spread function derived in Eq. (6) of Napolitano is only a good approximation at a single frequency (usually the center frequency), as represented by the variables k and λ . Hence, the phase correction calculated based on that equation is also only correct for that frequency. The matched filtering described in Eq. (7) which is based on Eq. (6) is also valid only at that frequency, and the Fourier transform approach, which implements the matched filtering in the spatial frequency domain, is also valid only at that frequency.

The Examiner cites to Freiburger et al. for use of a broadband transducer for frequency compounding in elevation. Freiburger et al. teach compounding two acquisitions of the same image plane using different sized elevation apertures. This compounds the spatial frequencies, not spectral frequencies. This use of the transducer does not result in the matched filtering process of Napolitano being a broadband process. Furthermore,

compounding combines grayscale image data after eliminating the phase information necessary for beamforming. The purpose of compounding is to reduce speckle, but may result in poorer resolution. Forming a beam across a synthetic elevation aperture may improve beam width to improve resolution. Similarly, combining signals associated with different frequencies may provide signals over a greater bandwidth, but not change the matched filtering into a broadband process.

Additionally, a person of ordinary skill in the art would not have used the teachings of Freiburger et al. with Napolitano. Freiburger et al. frequency compound data representing a same scan plane (Col. 5, lines 31-44). Conversely, Napolitano forms a synthetic aperture from overlapping but different elevation scan planes (Col. 4, lines 51-58). As discussed above, these two different processes provide different results. Given the different purposes and corresponding different scan approaches, there is no suggestion to use the teachings of Freiburger et al. with Napolitano.

The dependent claims 2-4, 7-8 and 11 are allowable for the same reasons as the independent claims from which they depend. Further limitations distinguish from Freiburger et al. and Napolitano. Claims 2-4 and 11 recite delay and sum beamformation for forming a beam across a synthetic elevation aperture. Napolitano uses matched filtering across the synthetic elevation aperture. Freiburger et al. compound data, but do not beamform to form a beam across an elevation aperture. Claims 3 and 4 further recite spatial considerations not suggested by Napolitano or Freiburger et al. Claim 7 recites two-dimensional beamforming. Such beamformation is not suggested by Napolitano. Freiburger et al. show one-dimensional beamformation.

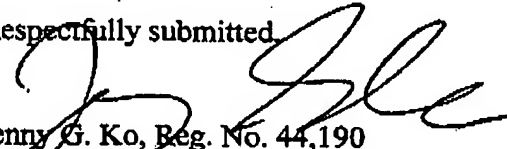
CONCLUSION:

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call the undersigned at (650) 694-5810 or Craig Summerfield at (312) 321-4726.

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Respectfully submitted


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